

Solutions to Practice Question 4: Symbolic Manipulations

(A)	(i)	$g(x) = \frac{\tan x (1 - \sin^2 x)}{\cos x}$ $g(x) = \frac{\tan x (\cos^2 x)}{\cos x}$ $g(x) = \frac{\sin x}{\cos x} \cdot \cos x$ $g(x) = \sin x$	1 pt
	(ii)	$h(x) = \log_3(x^2) + 10 \log_9 x$ $h(x) = \log_3(x^2) + 10 \cdot \frac{1}{2} \log_3 x$ $h(x) = 2 \log_3 x + 5 \log_3 x$ $h(x) = 7 \log_3 x, \text{ where } x > 0$	1 pt
(B)	(i)	$j(x) = e$ $\frac{e^4}{\sqrt{e^x}} = e$ $\frac{e^4}{e^{\frac{1}{2}x}} = e$ $e^{(4 - \frac{1}{2}x)} = e^1$ $4 - \frac{1}{2}x = 1$ $-\frac{1}{2}x = -3$ $x = 6$	1 pt
	(ii)	$k(x) = \frac{2\pi}{3}$ $\cos^{-1}(5x) = \frac{2\pi}{3}$ $5x = -\frac{1}{2}$ $x = -\frac{1}{10}$	1 pt

(C)	$m(x) = 6 \csc\left(x - \frac{\pi}{6}\right) = 12$ $\csc\left(x - \frac{\pi}{6}\right) = 2$ $\sin\left(x - \frac{\pi}{6}\right) = \frac{1}{2}$ $x - \frac{\pi}{6} = \frac{\pi}{6} + 2\pi k \text{ or } x - \frac{\pi}{6} = \frac{5\pi}{6} + 2\pi k \text{ where } k \text{ is an integer}$ $x = \frac{\pi}{3} + 2\pi k \text{ or } x = \pi + 2\pi k \text{ where } k \text{ is an integer}$	<p>Solves $\sin \theta = \frac{1}{2}$ for $0 \leq \theta \leq 2\pi$ 1 pt</p> <p>General solution expression 1 pt</p>
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